

AbstractID: 5240 Title: Comparison of LINACs either equipped with on-board imaging/cone-beam CT or CT-on-rails for IGRT

Introduction: The purpose of this study is to investigate the advantages and limitations of LINAC equipped with either OBI/CBCT or CT-on-rails with a 6D robotic couch-top for IGRT. **Method and Materials:** An optimal IGRT delivery system should be capable of handling the auto setup of the updated isocenter with 6D corrections, the adaptive radiotherapy, and treating multiple lesions simultaneously. The CT image quality should be suitable for designing a treatment plan. The planning CT and the daily CT are acquired in the treatment setup condition, minimizing systematic errors coiled into the image-data. A 60-cm diameter of maximum field-of-view (FOV) is crucial to scan almost all the patients. The scanning-range in superior-inferior direction should cover the maximum treatment-field available on the delivery system. It should have KVp and MV portal-imaging capabilities for setup verification. Monitor the target-isocenter shift due to couch rotation. A thoracic phantom was used to evaluate the IGRT setup accuracy using either OBI/CBCT or LINAC/CT-on-rails. **Results:** the current CT image quality of CBCT is suitable only for image registration. However, the relative large intra- and inter-variation of CT numbers for the same tissue inhibits the use of CBCT for treatment planning and adaptive radiotherapy. The single scanning-range of CBCT is limited to 14 cm. Both scanners need to increase the FOV to 60-cm diameter. The phantom study indicated that both units could setup the daily isocenter correctly based on the image registration. One of the findings suggests that the rotation corrections are essential for the crucial treatment to avoid treating the critical structures. It should be corrected either through a 6D robotic couch-top or software. **Conclusions:** Based on the image registration, LINACs equipped with either OBI/CBCT or CT-on-rails perform the IGRT treatment nicely. **Conflict of interest:** Supported in parts by SRA grants from Varian Medical Systems, Inc.